Desert Botanical Laboratory Complex
Tumamoc Hill
Tucson
Pima County
Arizona

HABS No. AZ-138

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ARIZ,
10-TUCSO
31-

PHOTOGRAPHS
WRITTEN DESCRIPTIVE AND HISTORICAL DATA
Reduced Copies of Measured Drawings

Historic American Buildings Survey
National Park Service
Department of the Interior
Washington, D.C. 20240

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HISTORIC AMERICAN BUILDINGS SURVEY

DESERT BOTANICAL LABORATORY COMPLEX
HABS No. AZ-138

Location:	Tumamoc Hill, Tucson, Pima County, Arizona
Present Owner:	University of Arizona
Present Occupant:	Department of Geoscience, University of Arizona
Present Use:	Biological research facility

HISTORICAL CONTEXT:

In 1901 F.V. Coville, Chairman of the Advisory Committee on Botany to the newly formed Carnegie Institution in Washington, D.C., proposed a desert laboratory. The purpose of the laboratory would be to provide facilities for the investigation of all facets of desert plant life and to determine the differences between desert vegetation and plants of more humid regions. Coville, in his argument, stated that the development and success of arid land agriculture, as well as pure scientific research hinged on this first desert laboratory.[1] As a result of Coville's proposal a grant was established for a desert laboratory and Mr. Coville and Dr. D.T. MacDougal were delegated to search for the most advantageous area for the new laboratory. They chose a site located just west of Tucson, Arizona, now known as Tumamoc Hill.[2] This site was chosen after an extensive survey of New Mexico, California, and Arizona. The natural and artificial advantages that led to the choice of the Tucson were: one-the area had a unique desert vegetation, two-the town of Tucson was of sufficient size and had a train stop, and three-the University of Arizona had a growing agricultural program.[3]

In 1903, with the designation of the site, Carnegie appointed the first resident investigator, W.A. Cannon, and hired a small staff.[4] The Tumamoc Hill site, water supply, road, and electrical hookup were donated by the Chamber of Commerce of Tucson, and construction was started on the first building.[5] The site of the first building was chosen about halfway up the 800 foot hill. The 'L'-shaped building of volcanic rock was built from stones removed from the hill's slope and carted to

the building site by mule-drawn wagons. The building's designer was S.F. Forbes of Douglas, Arizona. Forbes was recommended by his brother R.H. Forbes, a professor of desert botany at the University of Arizona. Building supervision was done by David Holmes, who taught at the University and was the architect of many buildings at the University of Arizona and in Tucson.[6] The building was considered most noteworthy for it's ventilation system consisting of intake vents on the soffit of the roof eaves, and exit vents in the form of dormers and a hip ridge vent.

The first years of the Desert Botanical Laboratory were very busy, with at least 5 major research papers written at Tumamoc Hill between 1903 and 1904.[7] In 1905 the Carnegie Institution organized a Department of Botanical Research, designating Dr. MacDougal, then the Director of New York Botanical Laboratory, as Director, and making the Desert Botanical Laboratory its headquarters. This new program, coupled with the lab's successful first years, led to a recommendation for the expansion of facilities and staff in September of 1905. Among the new staff members hired was Godfrey Sykes, an Arizona resident and personal friend of Dr. MacDougal. Sykes was hired as Facilities and Maintenance Director.[8]

In 1906 the Laboratory acquired land through leases and purchases, increasing its land holdings to more than 800 acres.[9] A building extension,started that same year to the east end of the existing laboratory, doubled the size of the facility and created a south-facing 'U'-shaped building. The addition was designed by David Holmes, who had managed the construction of the original section; the contractor for the addition was F.M. Welsh of Tucson.[10] The total building, then measuring approximately 126 feet long with 85 foor wings, was consistent in style and materials, giving the building a unified character. The discerning eye can

identify the juncture between the 1903 building and its 1906 extension. The roof of both the old and new sections was covered with slate shingles at the time of this new construction. With the addition, the Laboratory now contained a library and reading room, a drafting room, a photographic darkroom, as well as general laboratory and office space. The building also contained a chemical room with hoods and fume drafts, a subterranean constant temperature chamber, and a structural roof platform for meteorological instruments.[11] A greenhouse was started on the southeast end of the addition, but was not completed until 1907.[12]

Other improvements in 1906 included: two reservoirs, and a 5-mile long fence around the entire 800 acre site to keep out grazing animals which were disturbing the experimental plots. A reservoir to retain rainwater runoff from the roof of the main laboratory building was built just to the south of the building. Gutters and leaders were installed on both sections of the building and were connected to the reservoir. The collected water was used to maintain plant specimens. The second reservoir was built on the hill above the laboratory to help update the inadequate city water system. This reservoir was supplied with water pumped up from the Santa Cruz valley, from a 400 foot deep well dug for the Desert Laboratory. It took 7000 feet of pipe to connect the well to the reservoir![13]

In 1908 Dr. Forest Shreve and his wife joined the staff, and in this same year a second building was constructed. This building built at the base of the hill was designed by Godfrey Sykes; the construction contractor was again F. Welsh of Tucson.[14] This 20' x40' building, to be used as a shop, employed similar methods of construction and ventilation found on the main laboratory.[15] The walls were of double brick with a volcanic

rubble stone exterior surface; the wood floors were reported to have been built with "extra rigidity".[16] The roof was covered with slate shingles and had a ventilating ridge roll. A full complement of tools was installed, and the lighting was designed especially for the equipment use.[17]

The third stone building for the Laboratory was contracted for in June of 1914. Again the construction contractor was F. Welsh, for the stone and concrete work; a second contractor, J. Chapman, also of Tucson, was contracted to work on the building. Although the original designer is unknown, it is known that G, Sykes made alterations to the plan.[18] The building, located to the southeast of the main laboratory, was 46' x 28' with exterior walls of volcanic rubble stone, lined with structural brick. The building was designed as a Chemistry Laboratory, and was equipped with water, gas, air, AC and DC current, vacuum, and large fume hoods. The roof had a 30' x 25' flat insolation deck of lead, used for solar experiments. The remainder of the roof was covered with tar paper.[19]

Dr. Spoehr moved to Carmel, California in 1921, and the equipment from the Chemistry Lab was removed and sent to California to aid Dr. Spoehr in his research. Other changes done in 1921 included painting and woodwork maintenance and the replacement of the wooden sidewalks at the main building with tile.[20]

In the years from 1903 to 1937 the Desert Botanical Laboratory was extremely active. During this period of time main investigators included Dr. MacDougal who was affiliated with the Laboratory until its close; Augustus Spoehr, whose major concern was biochemistry of plants worked from 1910 to 1920. Dr. McGinnies worked for Carnegie from 1910 to 1932 and later was affiliated

with the Laboratory through the University of Arizona. Dr. Cannon worked from 1903 to 1938; and Dr. Shreve was supported by Carnegie even after the close of the Desert Laboratory until his death in the '50's. Godfrey Sykes, who was instrumental in the success of the Laboratory, retired in 1929. Besides the work done by these men, about 40 men and women worked from 2 to 12 months, and several hundred scientists from all parts of the world visited.[21] However, in 1938, due to economic problems, the Carnegie funding was drastically cut and only a small staff, under the direction of Dr. Shreve remained.[22]

On November 6th at 1:30 AM, 1938, a fire broke out in the Chemistry building. Before the fire was extinguished, most of the building was destroyed except the rock and brick walls, and the Main Laboratory was threatened.[23] The building remained unrepaired until the Forest Service bought the property in 1940.

In June of 1940 the Carnegie Institution sold the property to the U.S. Forest Service for one dollar, after offering it to the University of Arizona which declined.[24] The transfer included 220 acres of land owned by Carnegie, and 640 acres of leased state land. In June of 1941 The Southwestern Forest and Range Experiment Station moved to Tumamoc Hill. The property had been known locally as Tumamoc Hill, an Indian word for Horned-Toad, a desert reptile of Arizona common to that area of Arizona; however, the name had seldom been used while the property was the Carnegie Laboratory, but the name was quickly adopted by the Forest Service.

In 1941 the Forest Service began improvements to the property including widening the road up the hill, refencing, and adding evaporative coolers to the buildings. Major improvements included rebuilding the interior

and the roof of the Chemistry building, and the construction of a new building.[25]

The new building was a 37' x 45' rectangular building of volcanic rock, with concrete floors and a flat parapeted roof. The use of "vigas," a parapet roof, and the overall building form implies an attempt at regionalism, however, the result is a building more similar to the Santa Fe style than any Arizona style. The building was used for office space by the Forest Service.

In 1941 the Research Foundation of New York, in agreement with the Forest Service, built 2 metal buildings near the Chemistry building. They also improved the water system and added power lines during their period at Tumamoc Hill.[26] The metal buildings are still intact and in use.

The Southwestern and Rocky Mountain Forest and Range Experiment Station used Tumamoc Hill as its headquarters until September 1953, when the organization was consolidated under the name of the Rocky Mountain Forest and Range Experiment Station and moved its headquarters to Ft. Collins, Colorado. The Experiment Station continued to use only one of the Tumamoc Hill buildings after this consolidation; the other buildings remained empty until 1956. In 1956 the University of Arizona leased the buildings on the hill for use by the Geosciences Department, College of Earth Sciences.

In 1960 the University purchased the Tumamoc Hill Laboratory and its lands for $140,500, with the provision of one building to remain offices for the Rocky Mountain Experiment Station.[27] The University of Arizona's Department of Geosciences has used the buildings for offices and research

space, and conducted in-depth biological research from the hill since that time.

The desert Botanical Laboratory is important as the first center for the study of desert plant ecology, and for the outstanding scientists who paved the way for further development in the study of plants and ecology. The site itself is important also because of the numerous ancient Indian sites and artifacts still intact on the hill and in the surrounding area.

The Desert Botanical Laboratory was designated a National Historic Landmark in 1965, and was registered in 1975, and is listed in the National Register of Historic Places. In 1981 the complex was designated as a State Natural Area by the Arizona State Parks Board.

Notes

1) Yearbook of the Carnegie Institution (Vol. 1, 1902) p. 5.

2) Ibid (Vol. 2, 1903) p.xxvi.

3) Judith C. Wilder, "Years of the Desert Laboratory", Journal of Arizona History, (Vol. 8, #3; 1967) p. 78.

4) Yearbook (Vol. 2, 1903) p. xxvii.

5) Yearbook (Vol. 2, 1903) p. xxvi

also: Wilder, p. 78.

6) Gary D. Mathews, "Holmes and Holmes", p. 15.

7) Yearbook (Vol. 3, 1904) p. 100.

8) Yearbook (Vol. 28, 1928-29) p. 164.

also: Wilder, p. 78.

9) Yearbook (Vol. 5, 1906) p. 133.

also: Carnegie Papers, "Construction Contract with F. Welsh, June ,1914", The University of Arizona Special Collections, 1903-1938.

10) Ibid., June 1914 contracts.

11) Yearbook (Vol. 5, 1906) p. 134.

12) Ibid, (Vol. 6, 1907) p. 68.

13) Ibid, (Vol. 5, 1906) p. 135.

14) June 1914 Construction contract.

15) Yearbook (Vol. 7,1908) p. 72.

16) Ibid.

17) Ibid.

18) Dr. D. T. MacDougal; Personal letter from Godfrey Sykes, August 1914.

19) Yearbook (Vol. 14,1908) p.57.

20) Ibid, (Vol. 20, 1921) p. 63.

21) Wilder, p. 79.

22) Ibid.

23) "Tucson Daily Star", (Nov. 7, 1938) p. 2.

24) William McGinnies, Discovering The Desert, University of Arizona Press, 1981.

25) U.S. Department of Agriculture; Forest Service Report: The Tumamoc Hill Property of Tucson; (Dec. 3, 1957) p. 1.

26) Ibid, p. 2.

27) McGinnies, p. 38.

HISTORIC AMERICAN BUILDINGS SURVEY

Chronology and Physical Character

When Mr. Coville and Dr. MacDougal finally located a suitable site for the new Desert Botanical Laboratory, they were faced with a difficult problem: how could they continue their considerable research projects in Carmel and at the Salton Sea while at the same time assuring themselves and their benefactor, the Carnegie Institution, of a properly constructed laboratory? The solution presented itself in the person of Mr. S.F. Forbes of Douglas, Arizona; an architect of some note in the area and a friend of the researchers. Forbes designed the original structure as an 'L' shaped building about 60 feet along each leg. The building contained four large rooms: a main laboratory space of about 800 square feet, a storeroom/drawing room, a library, and a private study, each about 300 square feet. A photographic darkroom occupied one corner of the storeroom. Because of the relatively mild climate of Tucson, circulation space was provided outside the building along the east and south inner legs of the 'L' via a tiled walkway. The exterior bearing walls utilized native volcanic rock removed from a site nearby and laid with gypsum mortar in a neat, solid fashion. Massive stone lintels were utilized to allow installation of 17 - 3' x 7' wood casement windows and four transomed doors, allowing light and cooling breezes to penetrate the 18" thick dark stone walls. These walls were covered on the inside with smooth-troweled gypsum plaster applied directly over the stone.

The roof structure consisted of rafters with collar and knee bracing in a high, broad-hipped roof with deep overhangs to protect the walls from the sun. Ceiling joists at 12' supported wood lath and gypsum plaster ceilings.

These joists also extended the full width of the overhang, providing the structure for the tongue and groove board soffits. Aside from the shading already mentioned, the overhangs offered another advantage. Large cast iron grates were fitted into the soffits (and later removed and replaced with screens) and combined with a vent running the entire length of the ridge to allow the sun's energy to convectively flush the attic space with cooler outside air. This effectively insulated the laboratory spaces below from the searing desert sun, and kept them relatively cool even on the hottest of summer days. The shiplap roof sheathing was waterproofed with tarpaper and batten strips, due to the unavailability of funds to complete the proposed slate roof.

Floor joists of douglas fir were set on ledgers along the stone walls and supported tongue and groove douglas fir floors. The floors remained bare until 1906 when they were covered with linoleum. The crawl space under the floors was also ventilated by means of 9" x 12" cast iron grates set in the stone wall. Interior partitions consisted of wood stud walls finished with gypsum plaster. Plumbing and electrical were integral with the structure and served several lab work stations. Gas piping also served several burners. Heating was accomplished with two brick-lined stone fireplaces, one on the south wall of the main laboratory, and one set in the southeast corner of the library. Both fireplaces were removed as gas fired heaters were introduced, but the chimneys still provide exhaust for the new equipment.

In 1906, the laboratory's workload expanded, and the varied types of research being carried out required more space. The job of designing the extension fell to Mr. David Holmes, a Tucson architect, the man who had supervised the construction of the original structure. Holmes' plan call-

ed for the addition of two new laboratory spaces: a physical lab and a physiology lab, as well as a chemistry workshop, a greenhouse for horticultural experiments, and a horticultural workshop. A bathroom was installed in the workshop. This plan doubled the size of the laboratory, turning it into a broad 'U', which opens to the south. The only evidence that the building was completed in two parts is an almost indistinguishable joint in the north and south walls at the center, and the mitered joint of the soffit at the midpoint of the north and south sides, a remnant of the original hipped roof's return. The north facade of the original structure was carefully studied, as was the feel and character of the original building as a whole. Because of Mr. Holmes' sensitivity, the 1906 enlargement retains that character so much so that it can be called an extension rather than an addition. Once again, native volcanic stone was used for the walls; however, the mortar used to lay it up was of a slightly different color and consistency. Except for this minor detail, and the thickness of the wall that separates them, the stonework on the two halves is exactly alike. Rough stone lintels span openings containing the same casement windows and transomed doors. The high roof was extended to cover the entire structure, but ended on the east wing with a gable end to accommodate the high-roofed wood framed greenhouse. The eave and ridge vents were the same type as in the original structure. Also at this time, the entire structure was reroofed with slate, further unifying the original and new sections. One observer was so impressed by the appearance of the building, he professed it to be "a natural object in the desert."

Additional research facilities were incorporated into the extension. These included a rooftop meteorological platform in the center, accessed via a stairway in the chemistry shop; and a subterranean constant temper-

ature chamber, approximately 6' x 7', dug directly out of bedrock. The chamber was insulated by double-brick walls with an airspace between them, and had a poured concrete floor. It too was accessed through the chemistry shop. Fireplaces were installed in the two new laboratories to supplement the two that already existed. Those fireplaces remain today.

With the extension came many improvements in the water and gas system for the labs. Gutters and downspouts were installed and connected to a new stone cistern south of the building; water collected in this way was utilized in the new horticultural experiments. The tiled walkway was extended around the entire inside of the 'U'.

As seen today, the building is little changed from the way it appeared in 1906. Many superficial changes in the interior plumbing, gas, and electrical systems have been made, but these do not affect the character of the building.

The U.S. Forest Service acquired the building in 1940, and by 1941, had completed installation of three evaporative coolers on the roof. It is also believed that the Forest Service installed the new bathrooms in the west wing, but evidence as to the exact date of the installation is sketchy. The Forest Service also rebuilt the greenhouse which had fallen into disrepair, and evidence indicates that it was rebuilt according to the original plans. In 194_, the University of Arizona began to use the laboratory as a paleoenvironmental lab. Changes in the use of the spaces of the building was necessitated by differences in the types of work being conducted by the university scientists who now work there. In addition, the University reroofed the building in 1971, removing the ridge vent and replacing it with turbine ventilators. It is also believed that

the University is responsible for installing an acoustical tile ceiling in the easternmost room of the main wing, now used as a library. This was done to accommodate the new coolers which the University installed. The University also reconditioned the greenhouse, replacing the glass with plexiglass panels to alleviate maintenance problems. These changes, however, do little to affect the overall character of the structure, and it remains a harmonious part of the desert which it inhabits.

Architectural Merit and Interest:

This early 20th century building was begun in 1903 by the Carnegie Institution as a Desert Botanical Laboratory. It was constructed of local volcanic rock. In 1906 the building was extended in the same form to double its size. For several years this structure was the center for all the laboratory's desert environmental studies.

Condition of Fabric:

Generally good, but there are indications of settlement problems.

Overall Dimensions:

127' E-W length, West wing: 53'-3" N-S, East wing: 59'-10" N-S, 23'-4" N-S of main section width.

Number of Stories:

One

Layout Shape:

'U' shaped.

Foundations:

Volcanic rock set in lime mortar

Wall Construction, Finish and Color:

Dark volcanic rubble rock set in lime mortar, exterior.

Structural Systems, Framing:

Rock bearing wall supporting 2" x 5½" joists and 2" x 4" and

2" x6" rafters, all at 16" on center.

Walkways:

Red clay tile walkway on the south side of the building in the court area. The tile is set in a cement mortar. A volcanic rock retaining wall 1'-6" in height helps to define this walkway.

Chimneys:

There are four stucco-covered brick chimneys on the 1903 section of the building, and two volcanic rock-faced chimneys on the 1906 section. All chimneys have brick flues.

Openings:

Doorways and Doors: The doorway openings are formed with large rock lintels. There are eight doorways on the court side of the building, and one doorway on the east side of the east wing. All doorways have screen doors and screened transom windows. The doors have a glass panel over a wooden panel.

One doorway at the center of the south facade, and the doorway on the west side of the east wing occupy former window openings. The east doorway to the laboratory room has been replaced with a single glass panel double door.

Windows: Majority of the windows are double wooden casement windows with two panes on each leaf. There are two hopper windows: one on the north side and one on the west side. Each leaf of these windows have two panes of glass. A window on the west is a small square single casement window. It has four panes of glass. All windows have long rock lintels.

Several of the double casement windows show signs of being rehung to open out. This makes an alternating pattern of windows opening in and opening out.

Roof:

Shape, Covering: A hip roof with a gable on the south end of the east wing; grey asphalt shingle surface.

Cornice, Eaves: Eaves project about 4' on all sides except the east side of the west wing which projects 8'. The eave has a wooden soffit with 1'-8" x 2'-6" soffit vents located all along the eaves. A rain gutter is hung on the east facade of the building and on the inside part of the court.

Miscellaneous: A platform is located at about the center of the building straddling the ridge of the roof. Six turbine vents are on the roof's ridge and four evaporative coolers are on the slope of the roof of the inside part of the court.

Floor Plans:

Basement: There was once a constant temperature chamber in the basement under the 1906 portion of the building. It is 7'-1 3/4" long and 5'-5 3/8" wide. The ceiling height is 6'-3 3/16" to the wood ceiling. It has a concrete floor, and the walls are of red brick.

Main level: The original 1903 portion of the building had an L-shaped plan which opened up to the southeast. The long leg was on the north side and it contained the principal laboratory with an office, darkroom, and restroom facilities to the west end of the leg. The shorter leg of the 'L' contains two small offices and restroom faciltiies.

The 1906 addition was also L-shaped which opened up to the southwest and abutted the original building. The longer leg , on the north, contained two small offices towards the west end of the leg, and a library on the northeast corner. The library had a fireplace on it's

south wall. Another fireplace is located on the west wall of the office which is between the other office and the library.

The shorter leg contains a small laboratory which abuts the library on it's south wall. This laboratory provides access to a greenhouse which is abutted to the south wall of the laboratory. Access to the greenhouse is also available from the south end of the greenhouse.

Most of the rooms are accessible through doors on the inside part of the court. The library is the only room that has access to the east facade of the building.

Attic: The attic is unfinished and contains electrical tubing, a telephone panel, and a wooden ladder which leads up to the roof's platform.

Stairways:

The attic access stair is located on the west wall of the office which abuts the principal library. Built of wood, it is made up of two risers to a platform, then sixteen more risers which lead to the attic. The risers are 8½" and the treads are 8 5/8". The width of the stairway is 2'-4" and there is a simple wooden handrail.

Flooring:

Flooring is of douglas fir covered with green linoleum sheets.

Wall and Ceiling Finish:

The wall is painted plaster. The ceiling in the library is a dropped acoustical tile ceiling. The office on the south end of the west wing has modern acoustical tile attached to wooden lath. The office next to the library also has an acoustical tile ceiling but these are of an older time period and don't have any holes. The rest of the rooms have plaster on wooden lath ceilings.

Doorways and Doors:

All openings have simple moulded trim. All interior doors have 5 horizontal wooden panels set in a wood frame.

Trim:

There is a wooden picture rail about 2 feet below the ceiling. This picture rail is located in every room except the small laboratory and the greenhouse. Also in each room there is a wooden base board about 7½" high.

Hardware:

Some doors have a stamp design door handle. Most of the hinges are butt hinges. On the casement windows there is a simple small latch. All hardware appears to be of brass.

Lighting:

The lighting is composed of modern fluorescent tubes which are hung from the ceiling.

Mechanical Equipment:

Heating is done with gas space heaters. Evaporative coolers and ridge turbine vents are used to cool the building. A modern plumbing system was placed in about 1940.

General Setting and Orientation:

The building is et about half-way up the north slope of the hill. This building is part of a complex which formed the Desert Botanical Laboratory. The other structures are located to the southeast and to the south. This building's court faces south and the longest dimension of the building runs along an East-West axis.

Historical Landscape Design:

The original native vegetation seems to have been saved during the construction of the building. There are gravel paths which

are defined with volcanic rocks.

Outbuildings:

There is a round reservoir located to the south of the building. It is partially subterranean. There are volcanic rock walls and a concrete slab covering.

HISTORIC AMERICAN BUILDINGS SURVEY

Building Name:

Shop Building, Desert Botanical Laboratory

Address:

Tumamoc Hill, Pima County, Tucson, Arizona

Architectural Merit and Interest:

This turn of the century native volcanic stone building, built in 1908, was a service building for the Desert Botanical Laboratory of the Carnegie Foundation.

Condition of Fabric:

Structurally sound, superficial deterioration.

Over-all Dimensions:

20' North-South, 40' East-West.

Number of Bays:

N/A

Number of Stories:

One

Layout, Shape:

Rectangular

Foundations:

Poured concrete.

Wall Construction, Finish and Color:

Stone, brick interior with lime mortar; exterior volcanic rubble stone with high lime content mortar.

Structural System, Framing:

Bearing wall supporting 2 x 6 joists; 2 x 4 rafter system 24" o.c. on a 2 x 6 wall plate. Brick segmental arched openings; double header arch over windows and entrance door; triple header arch over sliding door; entrance surface on arches stucco and scored to resemble stone.

Porches, Stoops, Bulkheads:

Concrete apron at main sliding door at center of south facade. Concrete step at entrance door at east end of south facade.

Chimneys:

One chimney made of volcanic rubble stone with brick flue, located near the west end of the south facade and flush with the exterior wall.

Openings: Doorways and Doors

One, four panel wood entrance door at east end of south facade.
One, two panel vehicular entrance, made of 3-1/4" diagonal T/G wood with v-groove, at center of south facade.

Roof:

Shape, Covering:

Slate tile hip roof, with ridge vent, running east to west.

Cornice, Eaves:

Rafter ends and roof sheathing exposed.

Dormers, Cupolas, Towers:

None.

Floor Plans:

Single room.

Former wall separated a room on west side.

Stairways:

Iron ladder to attic.

Flooring:

3-1/4" T/G fir, running east to west on (full) 2 x 10 joists, set on dirt 16" o.c.

Wall and Ceiling Finish:

Exposed brick 3-1/2" x 8-1/2" x 4-3/8" (to ¢ joint), common bond with header every 7th course.

Doorways and Doors:

No interior doors.

Special Decorative Features, Trim and Cabinet Work:

4" flat board trim around openings.

Notable Hardware:

Standard door and window hardware.

Mechanical Equipment:

Formerly - heating by stove (fuel ?)
plumbing, one sink with well water.
electrical, added to interior of structure.

General Setting:

West of access road to Desert Botanical Laboratory at top of hill; located in a clearing among low desert vegetation.

Historic Landscape Design:

Native Vegetation

Outbuildings:

Foundations for other structures - one slightly southeast, the other to the west.

Chronology and Physical Character

The Shop Building for the Desert Botanical Laboratory was built in 1908 at the base of Tumamoc Hill. The 20' x 40' native volcanic stone building was built after designs by Godfrey Sykes, then the Facilities and Maintenance Director for the Laboratory. The construction contractor was F. Welsh of Tucson, who had built the addition to the main lab building in 1906.

The walls were built of the stone and lined with a double wythe of brick which was left exposed on the interior. The openings were arched with brick arches. These arches were plastered on the exterior; the plaster being formed and molded in such a way as to appear to be large ashlar stone. The arches were again exposed on the interior.

The floors were constructed of "extra rigidity" of tongue and grrove planks resting on a joist and beam system, to accept the weight of the tools.

The illumination was "designed especially with regard to the use of the apparatus and tools with which it is furnished."

The roof was covered with slate shingles and "furnished with the ventilating ridge which has been found so efficient in other buildings of the laboratory."

The shop was furnished with iron- and wood-working tools: "A full complement of carpenter's and cabinetmaker's tools, lathe, drill press, band saw, planer, forge, grinding wheels, etc., with fittings, have been put into place, and separate motors have been fitted to the larger tools; current being secured from a line leading to the Laboratory."

The shop was built to aid in reducing costs, both monetary and time, by having in-house service for construction and maintenance of machinery and equipment. It was used in 1909 to construct a new boat for the use of laboratory personnel during the course of their travels and studies.

Historic American Buildings Survey

Desert Botanical Laboratory , Chemistry Building

Address:

Tumamoc Hill, Tucson, Pima County, Arizona

Architectural Merit and Interest:

Volcanic rubble stone building built in 1914 to serve as the Chemical laboratory for the Desert Botanical Laboratory of the Carnegie Institution, established in 1903. The building was gutted by fire in 1938 and rebuilt sometime in the 1940's by the U.S. Forest Service.

Condition of the Fabric:

In general, the building is in good condition with slight deterioration of the exposed exterior wood.

Overall Dimensions:

46'x28'

Number of Stories:

One

Layout Shape:

Rectangular

Foundations:

Poured Concrete

Wall Construction, Finish and Color:

Volcanic rubble stone exterior laid in a soft lime mortar with harder cement mortar patching. Double wythe brick in the common bond (header course every eight course), exposed on the interior and painted. Poured concrete lintels with brick jack arches in-

side. Over east window is a double steel angle lintel.

Structural System, Framing:

Shale brick (3½"x8½"x4 3/4") and volcanic stone bearing walls with 2" x 6" wood joists and 2" x 6" rafters at 16" on center.

Porches, Stoops, Bulkheads:

Concrete stoop at south entry; raised platform at north entrance made of a 4" thick concrete slab over a stone apron, platform has a 2" pipe railing.

Chimneys:

Two volcanic stone chimneys; one on the north slope, one on the south slope of roof; with sheet metal collar at base; brick construction for both below roof.

Openings:

Doorways and Doors: South and north entrances with transoms, wood framed. North door has a glass panel and a wood panel. South door is a newer flush hollow-core.

Windows and Shutters: Wood double-hung windows, one over one sash, weighted. East window dating from the rebuilding after the 1938 fire has two windows side by side with wood center piece.

Roof:

Shape,Covering: Hipped roof with ridge running east-west; covered ridge vent; grey asphalt shingle surface.

Cornice, Eaves: 4'-6" overhang, tongue and groove soffit with soffit vents (18" x 24" screened), 2" x 6" fascia board, and 4" crown moulding at wall.

Dormers, Cupolas, Towers: Evaporative cooler on south slope of roof.

Floor Plans:

The original plan contained 5 rooms, one large room occupied

the west half of the building. The other half was divided into quadrants (4 abutting rooms divided by 9" thick brick partitions). The existing plan is unchanged for the east half. The large west room is divided by frame partitions into 3 rooms (2 rooms at west and one extending from south to north). So there are now 7 rooms separated by 3 brick partitions to the east and 2 of stud construction to the west.

Stairways:

None

Flooring:

Concrete slab with linoleum flooring except for microscope room (located at center of south side) which has bare concrete.

Wall and Ceiling Finish:

Interior partitions of exposed brick (shale) in running bond with struck joints; steel lintel over interior brick openings; tension rod running east-west, tying the 2 north-south brick partitions. Wood stud partitions with 4' x 8' cellulose wood fiber wall panels and wood battens.

Ceiling consists of 1½" thick wood fiber panels nailed directly to roof joists.

Doorways and Doors:

2 two-panel doors in the east portion of building; hollow core doors for the wood partitions. Doorways have flat board moulding 3½" and 4" wide. Interior window trim has 3½" flat moulding.

Special Decorative Features, Trim and Cabinet Work:

5½" base board on frame partitions; 2" crown moulding on brick walls.

Notable Hardware:

Standard hardware throught.

Mechanical Equipment:

Space heaters (formerly heated by stoves), electrical lighting, no plumbing.

General Setting:

Desert area; east of parking area on top of Tumamoc Hill; site slopes slightly to the north-east.

Historic Vegetation:

Native vegetation.

Outbuildings:

Small wood shed housing water pump south of building in fenced enclosure.

Desert Botanical Laboratory

Chemistry Building

Chronology and Physical Character

The Chemistry Building, located to the southwest of the Main Laboratory was contracted for in the June of 1914. The contract, written by Dr. MacDougal and G. Sykes, set forth the building requirments and prices to be met by F.M. Welsh, the construction contractor.[1] Welsh, a concrete contractor from Tucson, had worked on both the addition to the Main Laboratory and on the Shop building. A second Tucson contractor, J. Chapman, was also hired. Although the architect is unknown, it is known that Godfrey Sykes made design decisions during construction and supervised construction of the building.

The plan of the building was a rectangle 28' wide and 48' long, containing 5 rooms. The largest room, located on the west end of the building, was designed as the main laboratory for chemical experiments and microscope work. A second laboratory, located adjacent to the main laboratory on the south-center third of the building, was a photochemical darkroom. The east end of the building was divided into 2 rooms. The northeast room served as entry to the building, and as a machine and chemical preparation room; the southeast room contained vacuum pump machinery. The north-center area of the building served as access to the two laboratory areas and as the building's library.

Foundations and footings were of concrete, carried down to the bedrock, and a cross foundation was laid for the west laboratory space.

The exterior walls were built of volcanic rubble rock; the stone was removed from an area of Tumamoc Hill just a few hundred feet uphill from the building site. Welsh was directed by Dr. MacDougal in the construction agreement to "(remove the rock) in such a manner as not to deface the landscape seriously",[2] The rock walls were constructed with lime mortar joints, and built to accommo-

date an interior height of 12'. On the interior, the rock walls were lined with structural double shale brick that supported the floor and roof systems, as well as creating a smoother interior room finish. The overall thickness of the finished composite exterior walls was 18". Four interior partitions were built of double brick, and were also structural.

Door and window lintels were of formed concrete and were poured and cured by Welsh on the site. Door and window frames were of wood and were shipped by train from California. Windows were operable with spring latched top opening sashes; the casement windows opened in to encourage good air flow.

The floors were laid early in the construction process. The wood joists and subflooring used in the majority of the building were laid integral with the construction of the brick walls. The subfloors of the vacuum pump room and of the machine room, both located on the east end of the building, were concrete and machinery anchor bolts were imbedded in the floors when they were poured.

The roof was a flat-topped hip roof; ceiling joists and roof trusses were of wood. The attic space was used for storage and experimental equipment. The flat deck was covered with sheet lead and used as an Insolation Deck for solar experiments; the remainder of the roof was covered with tar paper and later recovered with slate shingles.

The building was equipped with water, gas, AC and DC current, vacuum and air pressure. Four of the five rooms were plumbed and contained sinks; however, this building had no indoor toilet facilities. The utilities all eneterd the building through the southwest foundation wall; waste drains convereged and exited through the east corner of the building.

Built-in equipment included large corbeled brick ventilating hoods and fume

drafts located in the laboratory spaces. The building also had a structurally free-standing pier of brick with a soapstone cap. This pier had a concrete footing and was built during wall construction. The pier was used for microscopes and other delicate instruments that needed to be free from normal floor vibrations.

The building was completed in late 1914 and was used as a chemical laboratory until 1921. In 1921 a major part of the chemical equipment was removed and sent to Carmel, California, where Dr. Spoehr, once chemist of the Desert Laboratory, was working. Part of the building continued to be used as a chemical laboratory after this period; however, the majority of the building was used as office space.

On November 6th, at 1:30 AM, 1938, the Chemistry building caught fire. Before the fire was extinguished, the building's roof, floors, windows, and doors were destroyed, leaving only the rock and brick walls standing; and many important records and projects were destroyed. The building was not rebuilt until the Forest Service bought the property.

When the Forest Service bought the Botanical Laboratory, they began major improvements including the reconstruction of the Chemistry building for office use. The building was reconstructed in a character similar to the original building and to the other existing buildings on the site. However, a few minor changes from the original plan were made. The large west space was divided into three offices by the addition of 2 wood-stud and fiberboard partitions, and a window was added to the east facade. This window was about 6' wide and had a wood frame and a steel lintel. Original casement windows were replaced with double-hung wood framed windows and screens.

New floors were needed to replace the wood floors destroyed by the fire. These new subfloors were of poured concrete, flooring was linoleum.

The roof was rebuilt in the manner of the other buildings on the site, rather than as the roof originally found on this building; the flat-topped was replaced with a hip roof with soffit vents and a ventilating ridge roll. The roof structural system was 2x6 joists and rafters at 16" on center; the new roof was covered with slate shingles. A ceiling of wood fiber panels was nailed directly to the ceiling joists.

The brick fume hoods and brick microscope table were removed during reconstruction, as was all interior plumbing, although water faucets were left on the exterior.

New equipment included the addition of an evaporative cooler and fluorescent lighting.

In 1974 the slate roof was replaced with asphalt shingles by the University of Arizona. The university also replaced one window on the south facade of the building with a door, giving the building a second exit. The date of this alteration is uncertain.

Little has been done to the building other than the reroofing and minor maintenance since the 1960 acquisition of the property by the University.

Historic American Buildings Survey

U.S. Forest Service Building

Desert Botanical Laboratory

Address:

Tumamoc Hill, Tucson, Pima County, Arizona

Architectural Merit and Interest:

1940 building in Desert Botanical complex. Strong attempt to relate to historic buildings on site--local volcanic rock.

Condition of Fabric:

Generally good. Structurally sound, minor surface deterioration.

Overall Dimensions:

36'10" x 45'0"

Number of Stories:

One

Layout Shape:

Rectilinear

Foundations:

Poured Concrete

Wall Construction, Finish, and Color:

Local volcanic rock with cement mortar exposed--dark brown.

Structural System, Framing:

Stone bearing wall system with wood frame inset supporting ceiling joists and roof system.

Porches, Stoops, Bulkheads:

Porch on east side--raised platform with concrete floor and stone base of volcanic rock; iron pipe railing.

Openings:

Doors and Doorways: Single entrance door situated at center of east

facade. Wood frame with wood door having glass panel over solid panel.

Windows and Shutters: Wood double-hung sash, one over one pane.

Roof:

Shape, Covering: Flat, built-up asbestos roofing, sloped for drainage to common scupper at center of West (rear) facade.

Parapet: Stone parapet with cement mortar pointing. Rear parapet steps down toward center of building.

Floor Plans:

Entry is made into principal room at East-center of the building. There is an even distribution of rooms around the perimeter of the building so there is one room in each corner and one at the rear (west) center. A small restroom facility is located at the south-center.

Flooring:

Poured concrete slab with carpet; tile.

Wall and Ceiling Finish:

Plaster applied directly to the stone; paint.

Doorways and Doors:

All doorways have 1 x 5 flat board trim; doors are of wood with glass panel over solid wood panel.

Special Decorative Features, Trim and Cabinet Work:

1 x 5 wood baseboard with quarter-round base shoe.

Notable Hardware:

Standard hardware through out.

Mechanical Equipment:

Central air conditioning/gas heat (unit on roof).

Standard plumbing fixtures.

Fluorescent lighting.

General Setting:

Situated at the west side of the Tumamoc Hill complex with its principal facade facing East.

Historic Landscape Design:

Natural, controlled desert vegetation; gravel paths defined by volcanic rock borders.

Outbuildings:

Underground storage facility to the Southwest, opens to the west on the slope of the hill.

Chronology and Physical Character

In June of 1940, The Carnegie Institution of Washington, D.C. turned over to the Forest Service its Desert Laboratory at Tucson, Arizona. The property became the headquarters for the Southwestern Forest and Range Experiment Station.

During the time the property was occupied by the Station several improvements were made. One major improvement was the construction of Building #2 shortly after the station occupied the site in June of 1941.

In September of 1953, the Southwestern and Rocky Mountain Forest and Range Experiment Stations were consolidated under the name of the Rocky Mountain Forest and Range Experiment Station, with Headquarters in Ft. Collins, Colorado. After the consolidation, a branch station remained in Building #2, sharing it with agricultural research service personnel.

From 1960, when the University of Arizona purchased the Tumamoc Hill property, the U.S. Geological Survey has leased this building.